pinions roughed out in (3). Like (2) this is a simpler machine, but worthy of attention. The roughed-out pinions are here turned true upon their own centres. Notice that when the tool has turned off the necessary amount it stops of itself, till started for a fresh piece.

(5) A pinion-polishing machine.—The polisher is driven to and fro by crank motion. After a sufficient number of rubs have been given the pinion turns automatically and presents a fresh face to the polisher, till all the leaves are done. The other side of the stand shows us a lathe requiring no special explanation.

(6) An automatic machine for cutting pinions.—In this is exhibited an elegant arrangement for bringing a succession of cutters into play. The principle, however, is very much better illustrated in the scape-wheel engine that follows; we therefore defer explanation.

Alongside of this machine is another for cutting the bevelled wheel teeth for keyless work.

(7) A scape wheel tooth-cutting engine. The scape wheels to the number of sixty are threaded upon a kind of split spindle, which passes through the spaces around their arms, and holds them firmly. The spindle with the wheels around it looks like a solid rod of brass, and the cutter acts transversely so as to scoop a groove through all the sixty at once. Owing to the peculiar shape of tooth and the degree of finish necessary, seven different cutters are required. The actions are as follow :—The spindle being placed in position, the first cutter operates. When it has made one groove the spindle turns; it makes another, and another, in all 15, which corresponds to the number of teeth. A sudden change now happens—the first cutter is diverted, and a second takes its place This cutter works through all the fifteen spaces, and then the next supersedes it, until all have had their turn and the wheel is finished. We understand that the whole sixty wheels are cut in about twenty minutes.

(8) Another polishing machine, of somewhat similar design to (5).

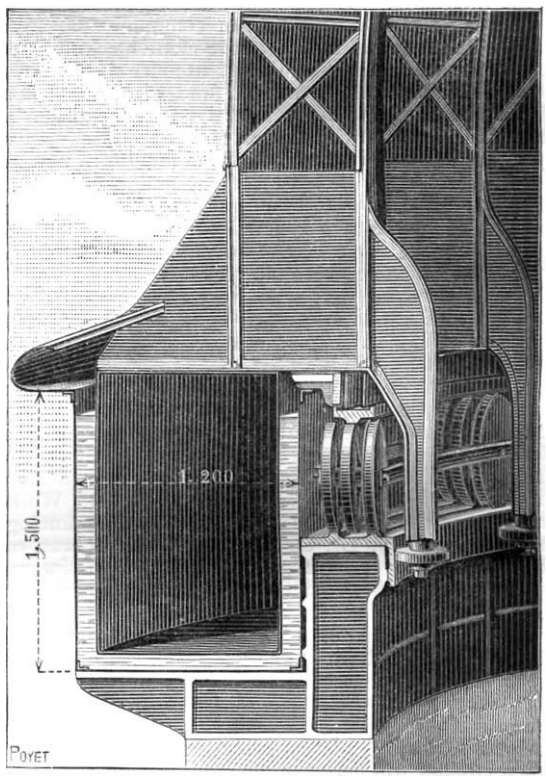
(9) On a counter opposite to the main stand is shown an interesting instrument for determining the strength of watch-balance springs. In this the differential principle is employed, the spring to be tested being measured against one of known force, and the number of degrees the latter is deflected registered. The springs are sorted into compartments corresponding to these numbers.

There are two other tools not working at present, but still of considerable interest. The first is supplementary to (9), which only gives the strength of the spring within certain limits. There is a normal balance with spring attached, and the balance and spring to be tested are mounted on an arm alongside of it. A lever sets both balances vibrating simultaneously, and it is easy to perceive in a few seconds whether their vibrations are synchronous or not. The other tool is automatic, and is for the purpose of drilling and tapping the screw-holes in compensation-balances. These holes are placed at irregular distances, as experience has suggested. By means of a divided plate the machine automatically finds these intervals. A very pretty feature will be noticed when the machine is drilling—viz. that the drill is withdrawn occasionally by the machine to free the cuttings, just as would be done by a workman.

HENRY DENT GARDNER

## THE NICE FLOATING DOME

WE have already (NATURE, vol. xxxii. p. 62) referred to the floating dome for the great equatorial of the Nice Observatory of M. Bischoffsheim. We give now an illustration from *La Nature*, which shows the details of the annular floater. The entire dome is supported on the annular floater situated at its base. The floater, of hollow metal, swims in a circular caisson containing water holding saline matter in solution. When the dome is in the position of normal buoyancy, the only friction which opposes its movement of rotation is the friction inside a liquid body, and consequently is extremely feeble, notwithstanding the great weight of the moving mass. Experiments prove that one man can easily set the dome in motion with his hand. The floater of the dome is open above like an undecked boat; it has a rectangular section of 1·50 m. in height by 0·95 m. in breadth. Its walls are bound together by rivets of steel.




The annular caisson, which receives the floater and the liquid, has a rectangular transverse section; its height is 1·50 m., and breadth 1·20 m. The latter dimension thus exceeds the breadth of the floater by 0·25 m., which gives a lateral play of 0·125 m. in the inside and 0·125 m. at outside between the floater and the caisson. Finally, the caisson rests on thirty-six strong cast-iron supports, distributed at equal distances over the upper part of the mason-work of the tower.

## A NEW ENDOWMENT FOR RESEARCH

IT is usually the case that private endowments for public purposes are made subject to narrowing restrictions, and then it too often ensues that with the lapse of time the very object of the gift is defeated by the restrictions—the letter kills the spirit. It must therefore be a matter of congratulation when a great public donation is left as free as compatible with the general object for which it is made. This is remarkably the case with a noble and munificent endowment established by Mrs. Elizabeth Thompson, of Stamford, Connecticut—an American lady well known for her public benefactions. Her long experience with churches and various charitable enterprises had led her to question whether the money spent in them achieves the greatest possible good. She finally reached the conviction that knowledge is the real source, the impelling power, of human progress, and it

became her desire, from motives of the highest philantropy, to contribute to the promotion of science.

When the plan for the establishment of an International Scientific Association was brought forward at Montreal, and again at Philadelphia before the great National Associations, Mrs. Thompson considered that the proposed International Society would be the fittest body to assume the trust she wished to establish. Accordingly, she placed in my hands the sum of 5000 dollars (1500*l.*) as the nucleus of a fund to be controlled by the International Association when organised.

Not long since Mrs. Thompson communicated to me her desire to transfer the above-mentioned sum to a board of trustees and to add to it at once 20,000 dollars more, making a total permanent fund of 25,000 dollars. Mrs. Thompson has been as liberal in the conditions she has established as in the amount she has given. According to her letter of conveyance, "the income of the fund is to be devoted to the advancement and prosecution of scientific research in its broadest sense, it being understood that to provide for and assist in the maintenance of an International Scientific Association is a method of application which seems to me very desirable."

The trustees are left with very great discretionary powers, which are to be guided by certain general directions. It is above all expressly understood that the prime object is to contribute from the income towards defraying the cost of scientific researches. The Board of Trustees consists of five members: Chairman, Dr. Henry P. Bowditch, Professor of Physiology and Dean of the Harvard Medical School; Treasurers, Wm. Minot, jun.; Prof. Edward C. Pickering, Director of the Harvard Astronomical Observatory; General Francis A. Walker, President of the Massachusetts Institute of Technology; and the Secretary, Dr. Charles S. Minot. It was considered important to have as great a variety of interests represented as possible, and this is accomplished by the association of these gentlemen.

When the International Association is organised the income of the fund presumably will be expended under the direction of that new Association; until then, under the direction of the trustees. The first appropriation will probably be made next autumn, when several hundred dollars will become available. At the proper time a circular will be issued announcing the manner in which applications may be made. As it is desired to give the fund an international character, it is hoped that foreign journals will copy this notice.

In conclusion I wish to express my admiration for the wisdom shown by Mrs. Thompson. It is certainly very remarkable that a person not specially versed in science, nor directly interested in any of its branches of investigation should be induced by a desire to benefit her fellows, not to give for some temporary need, but, with exceptional insight, to give for the development of the very sources of progress. The same sound judgment governed her decision as to the conditions of her gift, for it is difficult to foresee any probability which will render this endowment futile. Very often a public gift has its object determined by the donor's personal interests. I believe Mrs. Thompson was governed solely by her convictions as to the application of her money which would do most good.

At their first meeting the trustees voted unanimously to call their trust "The Elizabeth Thompson Science Fund."

CHARLES SEDGWICK MINOT

Boston, Mass., U.S.A.

## NOTES

WE are informed by Dr. Armstrong that arrangements have been made for two discussions in the chemical section over which he will preside at the meeting of the British Association at Aberdeen. The one will be on the Determination of the Molecular Weights of Liquid and Solid Bodies, the other on Electrolysis. It is proposed to have a series of critical papers read which shall embody, as far as possible and desirable on such an occasion our knowledge of these subjects, and also indicate the directions in which investigation is specially required and may be most usefully carried on. These subjects have been chosen as being of general interest and of special importance to the chemist, and in the hope of inducing chemists and physicians to cooperate in attacking the many problems which await solution. Capt. Abney will open the first discussion with a paper on the spectroscopic method. Profs. Guthrie, Reinold, and Dilden, Mr. S. U. Pickering, Dr. Russell and Dr. Armstrong will also contribute papers. Professor Lodge will open the discussion on Electrolysis, and Prof. Schuster, Capt. Abney, and Mr. Shelford Bidwell have already consented to contribute papers on portions of this subject. Dr. Armstrong will be glad to hear from any other gentlemen who may wish to aid in forwarding what promises to be a useful departure.

A TELEPHONE has just been brought to this country from America which is absolutely independent of electricity, so that batteries, coils, and cells are quite dispensed with. This obviously greatly simplifies the working of the instrument, and in the "mechanical telephone," which was recently subjected to a severe test, simplicity and distinctness are claimed as its chief characteristics. The instrument consists of a diaphragm, or sounding-board made of strips of willow wood, which has been found by experiment to possess a remarkable sensitiveness to sound vibrations. These strips of wood are closely woven together and varnished. In the centre of the diaphragm a small disc of metal is placed, from which the wire proceeds to any point desired up to two miles. In recent trials the instrument freely answered to all demands upon it, the ticking of a watch, musical sounds, whispering, &c., being heard with great distinctness.

WE understand the Fishery Board for Scotland, in order to learn further what has been done in other countries for increasing the fish supply, has requested Prof. Cossar Ewart, when on the Continent during the autumn, to visit some of the principal fishing stations in Norway and Sweden. It will be remembered that Prof. Ewart, by visiting at his own expense Canada and the United States last autumn, was able to present to his Board a valuable report on the "Progress of Fish Culture in America." An equally interesting report on the Norwegian fisheries may be expected.

IN accordance with previous announcements the summer meeting of the Institution of Mechanical Engineers will be held at Lincoln on Tuesday, Aug. 4, and the following days of the week. The following papers have been offered for reading and discussion after the address of the President, Mr. Jeremiah Head:—Description of Dunbar and Ruston's steam navvy, by Mr. Joseph Ruston, M.P., of Lincoln; on recent adaptations of the Robey semi-portable engine, by Mr. John Richardson, of Lincoln; description of the Tripier spherical eccentric, by M. Louis Poillon, of Paris; on private installations of electric lighting, by Mr. Ralph H. C. Nevile, of Wellingore; on the iron industry of Frodingham, by Mr. George Dove, of Frodingham; description of an autographic test-recording apparatus, by Mr. J. Hartley Wicksteed, of Leeds. A formidable programme of excursions and visits to various works has been arranged.

WE referred a short time back to a proposed excursion by the Geologists' Association to Belgium, under the direction of MM. Dupont, Gosselet, Purves, and Renard. The monthly circular, giving full details of the arrangements, is now before us, from which we learn that during the six days of the excursion (August 10 to 15) visits will be made to the typical sections of Cambrian, Devonian, and Carboniferous rocks, including the